

WHAT IS CLAIMED IS:

1. A duplexer comprising
a ladder filter and a multimode filter that are
5 formed on an identical surface of a predetermined
substrate,
a first comb-like electrode of the ladder filter
and a second comb-like electrode of the multimode
filter having an identical layer structure with an
10 equal film thickness,

the first comb-like electrode and the second
comb-like electrode being formed with single-layer
films mainly containing aluminum,

the relationship among the film thickness h of
15 the first comb-like electrode and the second comb-like
electrode, the center frequency f_1 of the frequency
band of the ladder filter, and the center frequency f_2
of the frequency band of the multimode filter, being
expressed as:

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$$\begin{aligned} 300 &\leq h \times f_1 \leq 480 \\ 300 &\leq h \times f_2 \leq 430. \end{aligned}$$

2. The duplexer as claimed in claim 1, wherein
25 the relationship among the film thickness h , the center
frequency f_1 , and the center frequency f_2 , is expressed
as:

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$$\begin{aligned} 300 &\leq h \times f_1 \leq 420 \\ 350 &\leq h \times f_2 \leq 410. \end{aligned}$$

3. A duplexer comprising
a ladder filter and a multimode filter that are
formed on an identical surface of a piezoelectric
35 substrate,
a first comb-like electrode of the ladder filter
and a second comb-like electrode of the multimode

filter having an identical layer structure with an equal film thickness,

the first comb-like electrode and the second comb-like electrode being formed with single-layer films mainly containing aluminum, or single- or multi-layer films including n layers (n being an integer of 1 or greater), the n layers including a layer mainly containing a metal other than aluminum,

the relationship among the film thickness h_k of the kth layer (k being an integer of 1 or greater) of the first comb-like electrode and the second comb-like electrode, the specific gravity α_k of the metal of the kth layer with respect to aluminum, the center frequency f_1 of the frequency band of the ladder filter, and the center frequency f_2 of the frequency band of the multimode filter, being expressed as:

$$300 \leq f_1 \times \sum_{k=1}^n (\alpha_k \times h_k) \leq 480$$
$$300 \leq f_2 \times \sum_{k=1}^n (\alpha_k \times h_k) \leq 430$$

4. The duplexer as claimed in claim 3, wherein the relationship among the film thickness h_k , the specific gravity α_k , the center frequency f_1 , and the center frequency f_2 , is expressed as:

$$300 \leq f_1 \times \sum_{k=1}^n (\alpha_k \times h_k) \leq 420$$
$$350 \leq f_2 \times \sum_{k=1}^n (\alpha_k \times h_k) \leq 410$$

5. The duplexer as claimed in claim 1, wherein the predetermined substrate is a rotated Y-cut X-propagation lithium tantalate substrate on which surface acoustic wave propagates in the X direction.

6. The duplexer as claimed in claim 1,
comprising a plurality of multimode filters.

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